OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **LOON POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. Chlorophyll-a concentrations decreased this season, and remain well below the New Hampshire mean reference line. The decrease in phosphorus concentrations likely helped to keep algae growth to a minimum this season. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows an *improving* trend in lake transparency, meaning transparency is increasing in the lake. The transparency in July was the highest observed reading since Loon Pond joined VLAP. The unusually high amounts of rain the lake experienced in July could have led to a decrease in transparency by causing more turbid waters from nutrient runoff, however the pond did not appear to be affected. This is a positive sign for Loon Pond. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is

the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable* trend for in-lake phosphorus levels. Phosphorus concentrations were slightly lower in the epilimnion and hypolimnion this season and remained below the state median. Mean hypolimnetic phosphorus concentrations were the lowest the lake has ever experienced. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- **Please note** in June the in-lake and Bertrand Brook phosphorus concentrations were <5 ìg/L. The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is less than 5 µg/L. We would like to remind the association that a reading of 5 ìg/L is considered low for New Hampshire's waters.

- In-lake conductivity appears to be gradually increasing over the years (Table 6). Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to uncover the reasons for increased conductivity as we continue to monitor the lake.

- Phosphorus concentrations in Varney Brook were elevated in July and August (Table 8). Heavy rainfall in July likely caused an increase of nutrients being washed into the brook, which also caused a slight increase in the conductivity. Phosphorus sources can include septic systems, agricultural runoff, fertilizers, and natural wetlands. Identifying potential phosphorus sources along Varney Brook would be valuable for the lake. Contact the VLAP Coordinator at (603) 271-2658 for suggestions about increased monitoring of this site.

- Bertrand Brook was flowing this year! This is the first time since 1997 that we were able to test the brook. Overall, pH remained stable; phosphorus concentrations decreased and were less than 5 ìg/L in June. Mean conductivity decreased, but results in July were still high after the heavy rain the previous week. We hope that Bertrand Brook continues to flow next season, so we can accurately track any changes in data. Collecting a sample during spring runoff or early in May would increase the possibility of finding running water

in this inlet. This would also help to discover any possible sources of pollutants that might enter the pond after spring runoff.

- The dissolved oxygen was high throughout the water column this year (Table 9). These levels are higher than they were during last summer's sampling season. Spring turnover (mixing) leads to high oxygen concentrations throughout the water column early in the summer. As the lake becomes more stable and stratified, oxygen may begin to decline in the bottom layer of the lake. This is a natural process that occurs in aging lakes, but it is also enhanced by human activities. Excess anthropogenic phosphorus from the watershed enters the lake, causing increased plant and algal productivity. When these increased populations begin to die off, they sink to the bottom of the pond where bacterial decomposition takes place. In the process of breaking down the organic matter at the bottom of the pond, these bacteria use up oxygen... more organic matter means more decomposition, which leads to more oxygen depletion. Because the lake is stratified, fresh supplies of oxygen from the atmosphere and from photosynthesis cannot reach the bottom, causing anoxic conditions to persist until fall overturn. By eliminating external sources of phosphorus, we are in turn reducing the overall amount of organic matter in the bottom of the pond, thereby slowing this aging process.

NOTES

- Monitor's Note (7/28/00): Many heavy rainstorms in previous week. Varney Brook very full and fast running.

- Monitor's Note (8/18/00): July had 21 days of rain.

USEFUL RESOURCES

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

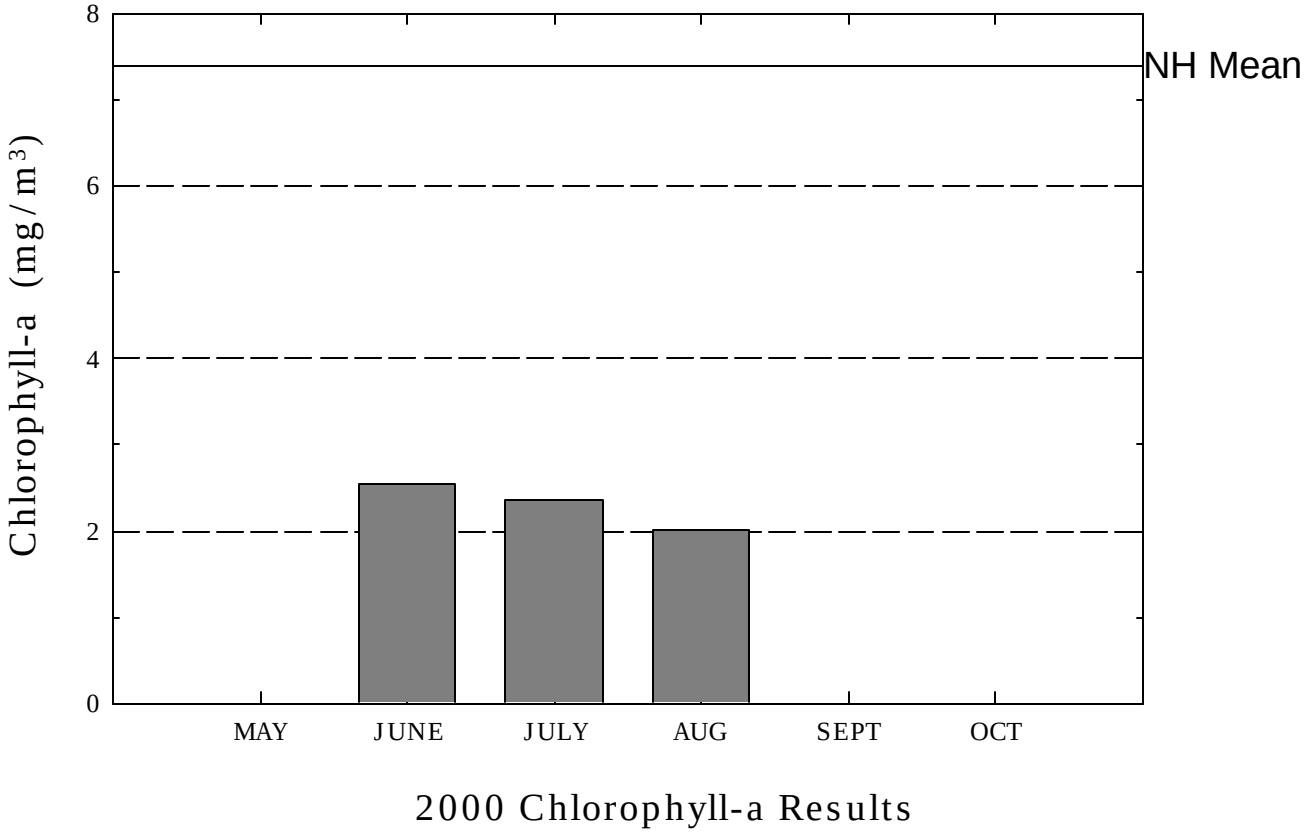
Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

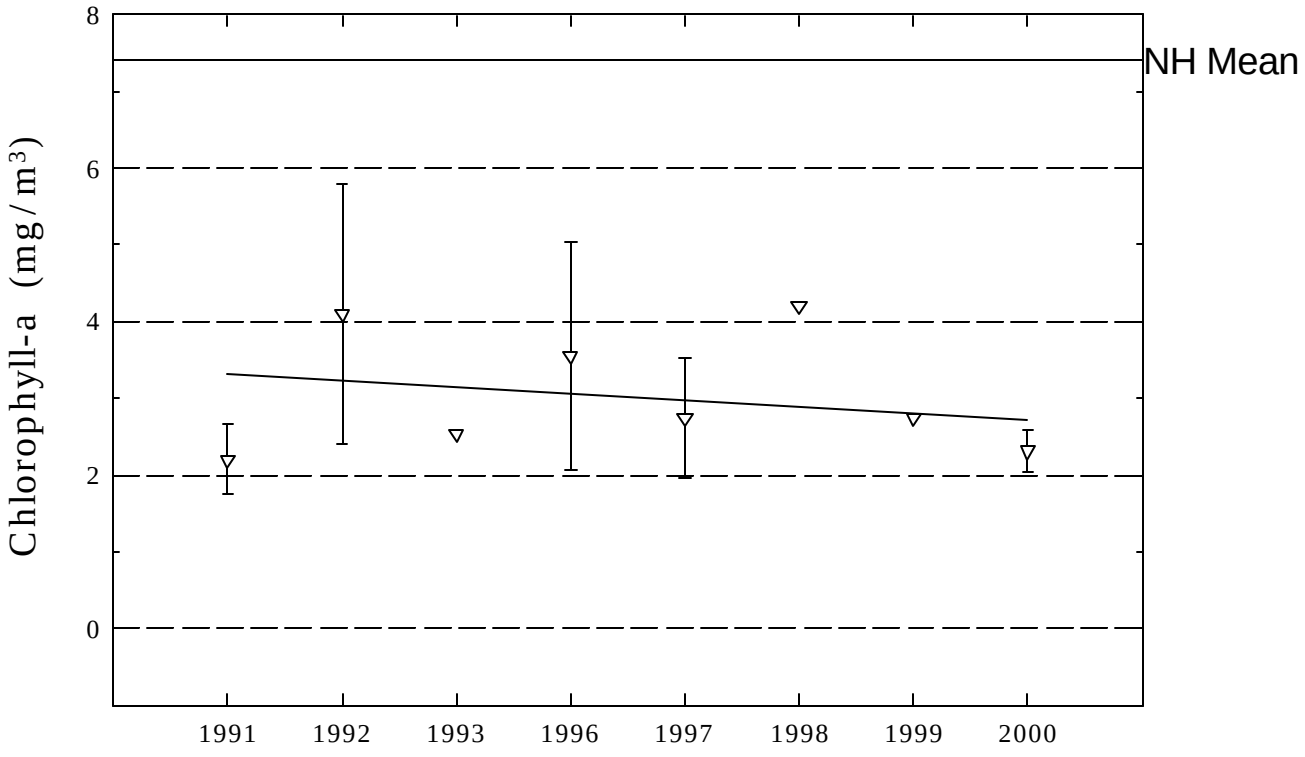
Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Loon Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



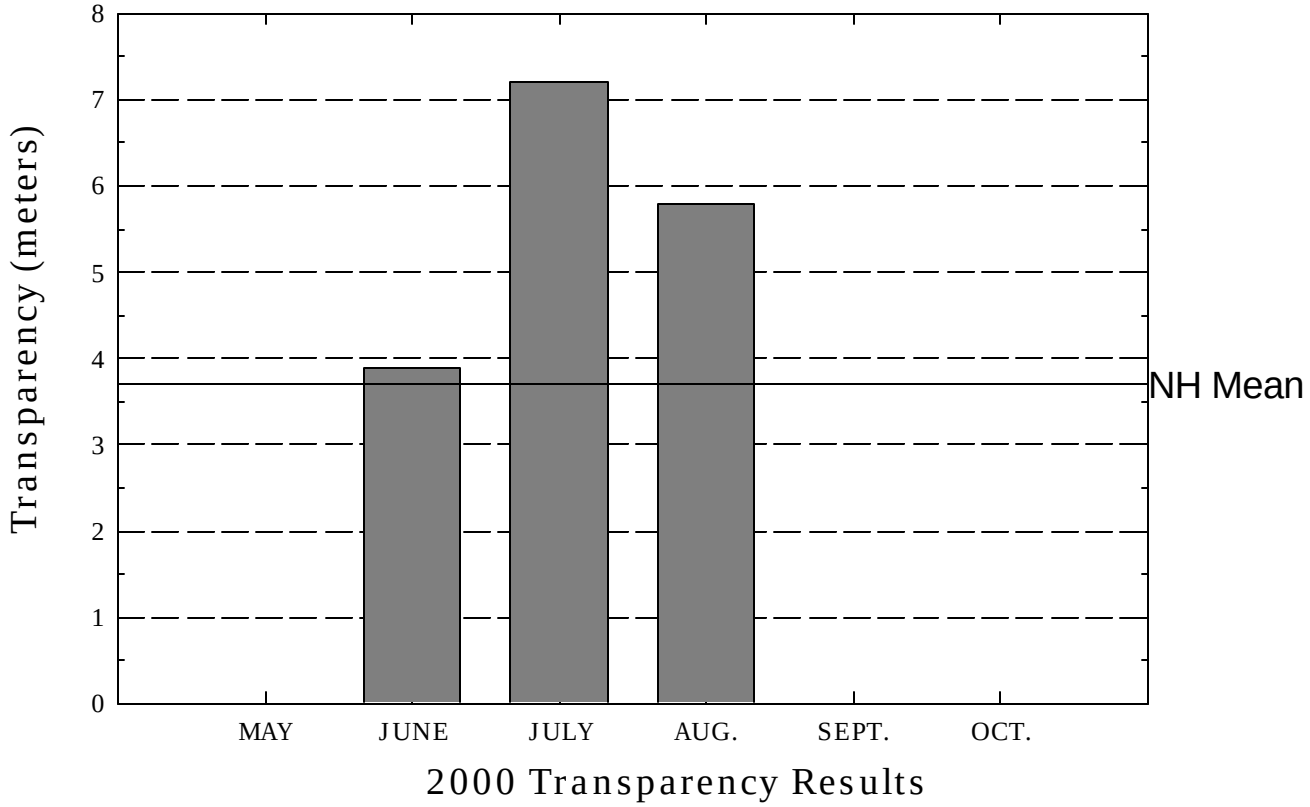
2000 Chlorophyll-a Results

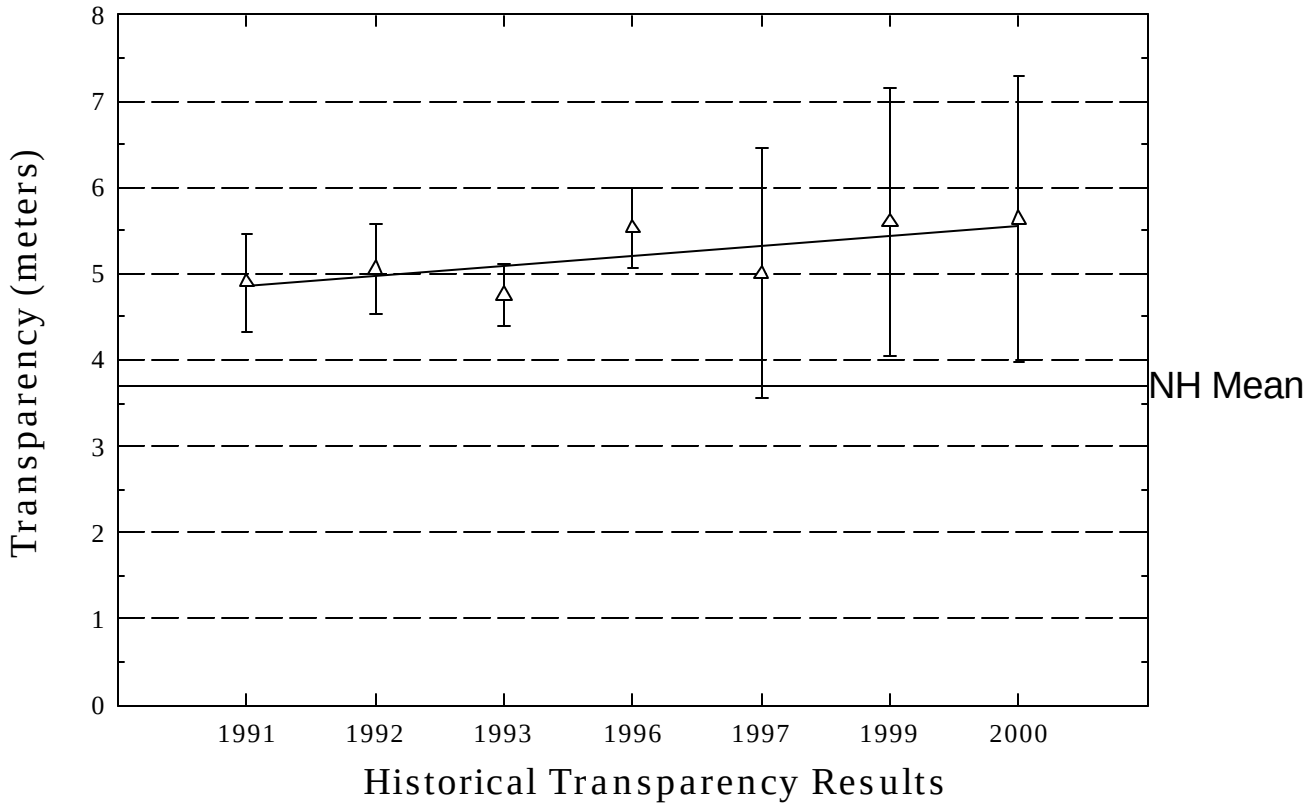


Historical Chlorophyll-a Results

Loon Pond

Figure 2. Monthly and Historical Transparency Results





Loon Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

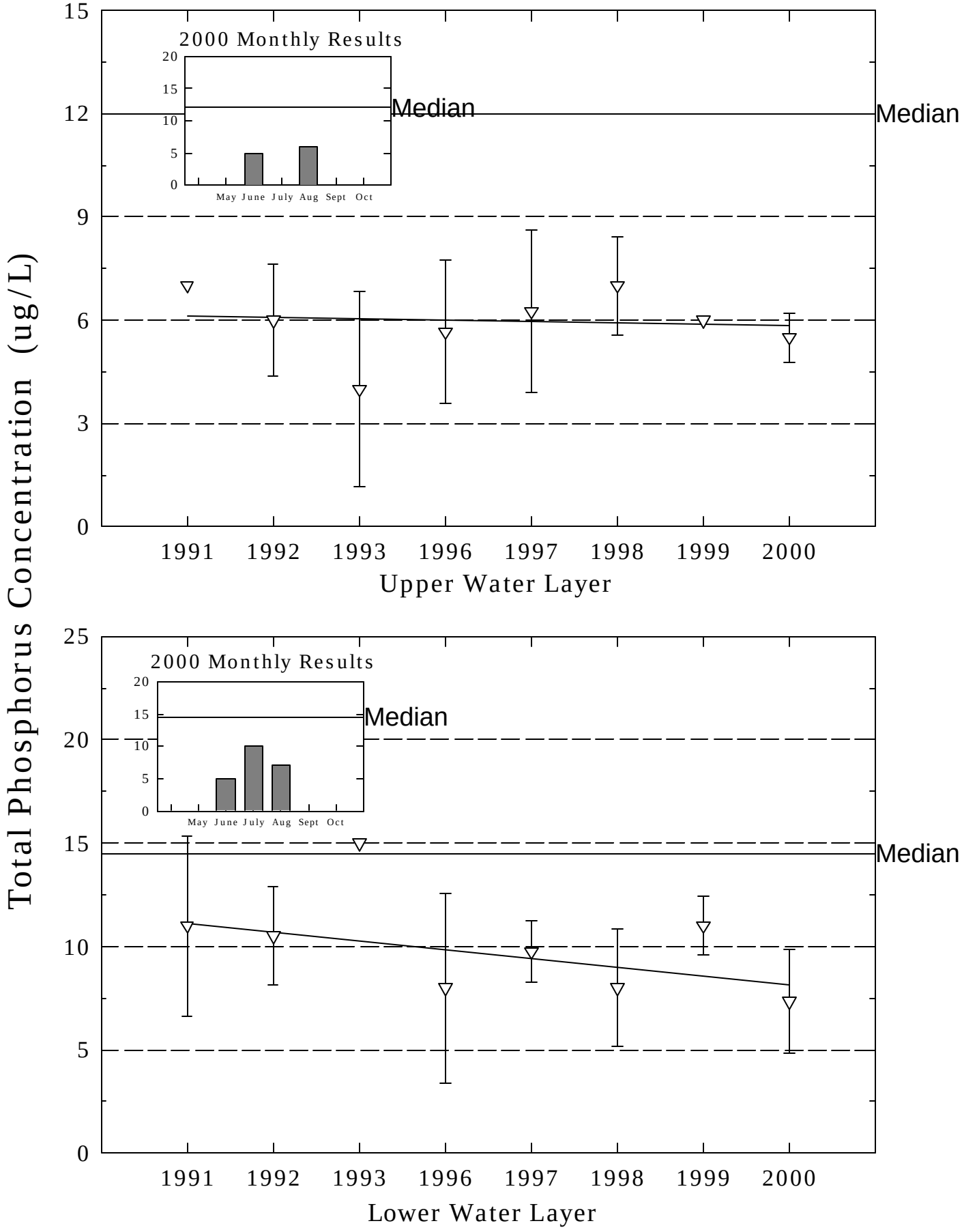


Table 1.

LOON POND

GILMANTON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1991	1.78	2.70	2.20
1992	2.92	6.56	4.10
1993	2.54	2.54	2.54
1996	1.85	4.55	3.55
1997	2.20	3.89	2.74
1998	4.20	4.20	4.20
1999	2.75	2.75	2.75
2000	2.02	2.54	2.31

Table 2.

LOON POND

GILMANTON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 26 / 1991	STAURASTRUM	34
	TABELLARIA	22
	CHRYSOSPHAERELLA	12
06 / 23 / 1992	ASTERIONELLA	31
	TABELLARIA	31
	DINOBRYON	25
07 / 15 / 1992	ASTERIONLELLA	75
	RHIZOSOLENIA	20
08 / 18 / 1993	TABELLARIA	35
	DINOBRYON	57
05 / 29 / 1996	ASTERIONELLA	37
	RHIZOSOLENIA	30
	DINOBRYON	19
05 / 23 / 1997	ASTERIONELLA	73
	MELOSIRA	10
	RHIZOSOLENIA	6
08 / 27 / 1999	DINOBRYON	45
	CHRYSOSPHAERELLA	38
	TABELLARIA	9
06 / 09 / 2000	DINOBRYON	44
	TABELLARIA	33
	RHIZOSOLENIA	11

Table 3.

LOON POND

GILMANTON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1991	4.5	5.3	4.9
1992	4.5	5.5	5.0
1993	4.5	5.0	4.7
1996	5.0	5.9	5.5
1997	3.3	6.6	5.0
1999	4.5	6.7	5.6
2000	3.9	7.2	5.6

Table 4.

LOON POND

GILMANTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
BERTRAND BROOK				
	1996	6.33	6.52	6.41
	1997	6.40	6.82	6.56
	2000	6.54	6.75	6.63
EPILIMNION				
	1991	6.99	7.30	7.08
	1992	7.04	7.07	7.06
	1993	6.74	6.97	6.84
	1996	6.34	6.86	6.50
	1997	6.67	7.02	6.77
	1998	6.63	6.78	6.70
	1999	6.70	6.79	6.74
	2000	6.61	6.89	6.73
HYPOLIMNION				
	1991	6.45	6.94	6.70
	1992	6.35	7.04	6.54
	1993	6.25	6.25	6.25
	1996	6.04	6.24	6.13
	1997	6.20	6.75	6.36
	1998	6.03	6.23	6.12
	1999	6.19	6.39	6.28
	2000	6.29	6.74	6.45
INLET				
	1991	6.51	6.90	6.61

Table 4.

LOON POND

GILMANTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1992	6.45	6.93	6.65
	1993	6.60	6.61	6.60
METALIMNION				
	1991	6.96	7.10	7.03
	1992	6.80	6.92	6.86
	1993	6.73	6.73	6.73
	1996	6.37	6.94	6.52
	1999	6.26	6.38	6.32
	2000	6.77	6.80	6.78
OUTLET				
	1991	6.97	7.33	7.14
	1992	7.01	7.20	7.11
	1993	6.88	6.93	6.90
	1996	6.53	6.53	6.53
	1997	6.66	6.98	6.82
	1998	6.82	6.82	6.82
	1999	6.75	6.95	6.84
	2000	6.73	6.84	6.77
VARNEY BROOK				
	1996	6.36	6.45	6.40
	1997	6.44	7.08	6.74
	1998	6.65	6.65	6.65
	1999	6.57	6.67	6.62
	2000	6.66	6.72	6.70

Table 5.

LOON POND

GILMANTON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1991	5.40	5.40	5.40
1992	5.30	6.10	5.63
1993	5.30	5.50	5.40
1996	4.40	5.70	5.17
1997	2.50	5.20	4.15
1998	3.80	4.40	4.10
1999	4.70	4.80	4.75
2000	3.60	4.00	3.80

Table 6.

LOON POND
GILMANTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
BERTRAND BROOK				
	1996	30.2	74.1	52.1
	1997	42.3	294.0	168.1
	2000	57.2	110.8	80.0
EPILIMNION				
	1991	68.0	68.8	68.3
	1992	74.1	75.5	74.8
	1993	77.1	77.8	77.4
	1996	75.3	76.7	75.8
	1997	68.8	70.8	69.8
	1998	65.0	70.9	67.9
	1999	82.7	88.4	85.5
	2000	94.1	97.6	95.8
HYPOLIMNION				
	1991	67.6	70.0	69.0
	1992	72.3	74.4	73.5
	1993	45.8	45.8	45.8
	1996	77.0	79.4	78.5
	1997	67.3	70.1	69.1
	1998	76.1	79.3	77.7
	1999	80.4	82.2	81.3
	2000	92.7	97.4	94.5
INLET				
	1991	112.1	136.9	122.1
	1992	116.1	147.6	130.9

Table 6.

LOON POND
GILMANTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1993	150.2	160.5	155.3
METALIMNION				
	1991	64.0	68.9	66.9
	1992	70.6	73.2	71.7
	1993	72.5	72.5	72.5
	1996	75.1	76.5	75.9
	1999	79.5	84.0	81.7
	2000	93.9	96.0	95.0
OUTLET				
	1991	68.9	70.5	69.7
	1992	73.6	75.3	74.6
	1993	75.9	79.2	77.5
	1996	75.3	75.3	75.3
	1997	67.2	71.5	70.0
	1998	72.3	72.3	72.3
	1999	83.0	86.8	84.9
	2000	94.1	97.7	96.2
VARNEY BROOK				
	1996	34.2	44.4	39.3
	1997	39.1	65.7	53.2
	1998	70.5	70.5	70.5
	1999	79.9	79.9	79.9
	2000	47.5	58.6	52.7

Table 8.

LOON POND

GILMANTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BERTRAND BROOK				
	1996	5	6	5
	1997	7	14	10
	2000	< 5	7	6
EPILIMNION				
	1991	7	7	7
	1992	4	8	6
	1993	2	6	4
	1996	4	8	5
	1997	3	8	6
	1998	6	8	7
	1999	6	6	6
	2000	< 5	6	5
HYPOLIMNION				
	1991	8	16	11
	1992	7	12	10
	1993	15	15	15
	1996	4	13	8
	1997	8	11	9
	1998	6	10	8
	1999	10	12	11
	2000	< 5	10	7
INLET				
	1991	12	25	19
	1992	5	14	11

Table 8.

LOON POND

GILMANTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1993	19	38	28
METALIMNION				
	1991	5	7	6
	1992	5	11	8
	1993	11	11	11
	1996	4	33	14
	1999	9	9	9
	2000	< 5	9	7
OUTLET				
	1991	10	15	12
	1992	5	10	7
	1993	2	7	4
	1996	17	17	17
	1997	5	10	7
	1998	4	4	4
	1999	6	7	6
	2000	< 5	6	5
VARNEY BROOK				
	1996	17	30	23
	1997	23	44	36
	1998	27	27	27
	1999	23	23	23
	2000	11	30	23

Table 9.

LOON POND

GILMANTON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		June 9, 2000	
0.1	16.7	9.3	95.7
1.0	16.6	9.5	97.5
2.0	16.6	9.5	97.7
3.0	16.5	9.6	98.3
4.0	16.4	9.6	98.5
5.0	15.3	9.6	95.8
6.0	12.7	10.6	100.1
7.0	9.2	10.1	87.4
8.0	8.3	9.0	76.3
9.0	8.0	8.4	70.5
10.0	8.0	8.2	69.3
11.0	7.9	7.6	64.1

Table 10.

LOON POND

GILMANTON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 26, 1991	11.0	8.2	3.1	26.2
June 23, 1992	13.5	6.0	6.0	48.0
July 15, 1992	13.0	6.5	2.3	18.6
August 16, 1993	12.5	8.3	0.6	5.0
May 29, 1996	12.0	9.2	4.0	35.0
July 30, 1996	13.0	9.0	2.3	20.0
May 23, 1997	11.0	8.5	10.8	89.0
August 27, 1999	11.0	9.3	0.5	4.5
June 9, 2000	11.0	7.9	7.6	64.1

Table 11.

LOON POND
GILMANTON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
BERTRAND BROOK				
	1997	0.0	0.2	0.1
	2000	0.2	0.6	0.3
EPILIMNION				
	1997	0.2	0.4	0.3
	1998	0.5	0.5	0.5
	1999	0.2	0.3	0.3
	2000	0.2	0.5	0.4
HYPOLIMNION				
	1997	0.3	0.7	0.4
	1998	0.6	1.8	1.2
	1999	0.5	0.9	0.7
	2000	0.2	0.6	0.5
METALIMNION				
	1999	0.5	0.7	0.6
	2000	0.3	0.7	0.5
OUTLET				
	1997	0.2	0.4	0.3
	1998	0.4	0.4	0.4
	1999	0.3	0.3	0.3
	2000	0.2	0.5	0.3
VARNEY BROOK				
	1997	0.8	1.8	1.2
	1998	1.3	1.3	1.3
	1999	0.8	0.8	0.8
	2000	0.5	1.0	0.7